

## VERY LOW DROP VOLTAGE REGULATORS WITH INHIBIT

- ULTRA LOW DROPOUT VOLTAGE (0.2V AT 100mA LOAD, 7mV AT 1mA LOAD)
- VERY LOW QUIESCENT CURRENT (MAX 1 $\mu$ A WHEN IS IN SHUTDOWN MODE)
- OUTPUT CURRENT UP TO 100 mA
- LOGIC-CONTROLLED ELECTRONIC SHUTDOWN
- OUTPUT VOLTAGES OF 2.85; 3.0; 3.2; 3.3; 3.8; 4.85; 5.0V
- INTERNAL CURRENT AND THERMAL LIMIT
- AVAILABLE IN  $\pm$  0.75% TOLERANCE (AT 25°C, A VERSION)
- OUTPUT LOW NOISE VOLTAGE 160 $\mu$ Vrms
- ONLY 4.7 $\mu$ F FOR STABILITY
- TEMPERATURE RANGE: -40 TO 125 °C
- SMALLEST PACKAGE SOT23-5L
- FAST DYNAMIC RESPONCE TO LINE AND LOAD CHANGES

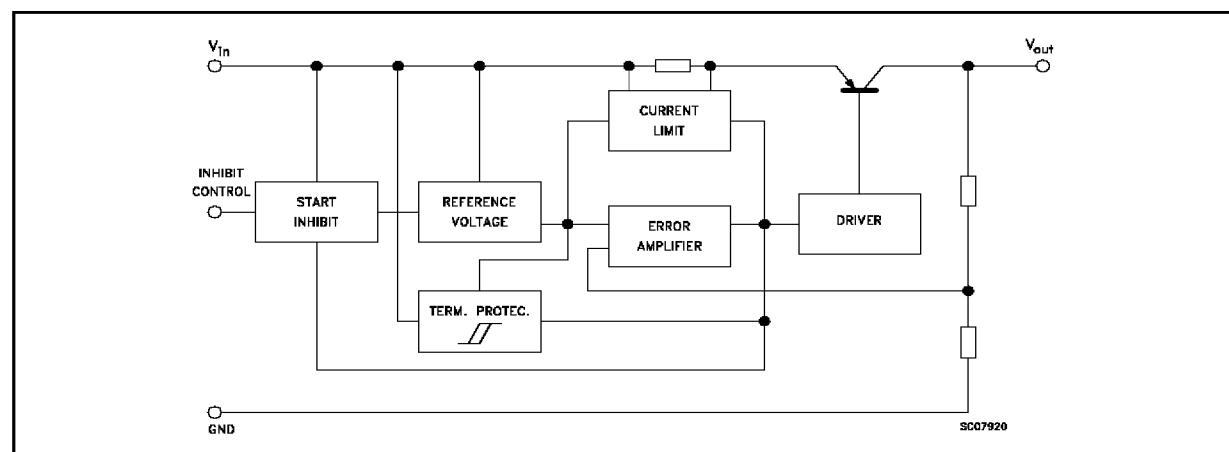
### DESCRIPTION

The LD2981 series are 100 mA fixed-output voltage regulator. The ultra drop-voltage and the ultra low quiescent current make them particularly suitable for low noise, low power applications and in battery powered systems.



In sleep mode quiescent current is less than 1 $\mu$ A when INHIBIT pin is pulled low. Shutdown Logic Control function is available on pin n.3 (TTL compatible). This means that when the device is used as local regulator, it is possible to put a part of the board in standby, decreasing the total power consumption. Typical application are in cellular phone, palmtop/laptop computer, personal digital assistant (PDA), personal stereo, camcorder and camera.

### SCHEMATIC DIAGRAM



# LD2981

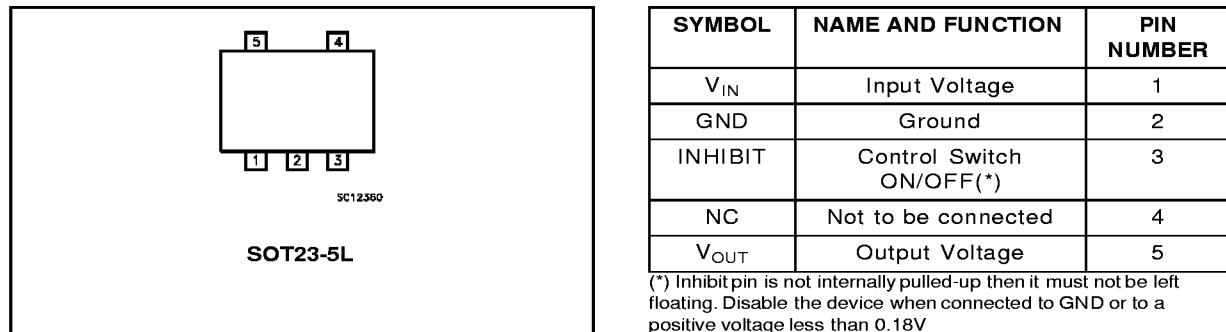
## ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
$V_{IN}$	DC Input Voltage	16	V
$V_{INH}$	INHIBIT Input Voltage	16	V
$I_o$	Output Current	Internally limited	mA
$P_{tot}$	Power Dissipation	Internally limited	mW
$T_{stg}$	Storage Temperature Range	- 55 to 150	°C
$T_{op}$	Operating Junction Temperature Range	- 40 to 125	°C

## THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal Resistance Junction-case	81	°C/W

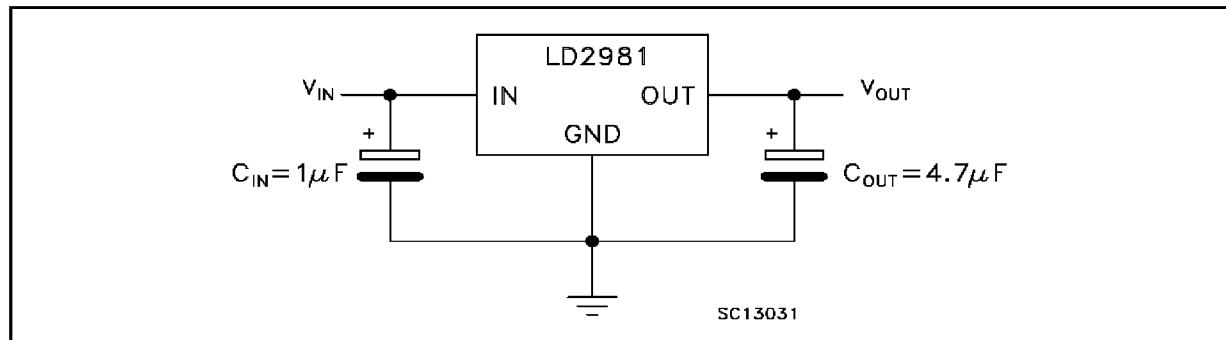
## CONNECTION DIAGRAM (top view)



## ORDERING NUMBERS

"AB" VERSION	"C" VERSION	Output Voltage
LD2981ABM28TR	LD2981CM28TR	2.85 V
LD2981ABM30TR	LD2981CM30TR	3.0 V
LD2981ABM32TR	LD2981CM32TR	3.2 V
LD2981ABM33TR	LD2981CM33TR	3.3 V
LD2981ABM38TR	LD2981CM38TR	3.8 V
LD2981ABM48TR	LD2981CM48TR	4.85 V
LD2981ABM50TR	LD2981CM50TR	5.0 V

## APPLICATION CIRCUIT



**ELECTRICAL CHARACTERISTICS FOR LD2981AB** (refer to the test circuits,  $T_J = 25^\circ\text{C}$ ,  $V_{IN} = V_{O(\text{NOM})} + 1$ ,  $C_O = 1 \mu\text{F}$ ,  $I_O = 1 \text{mA}$ ,  $V_{INH} = 2\text{V}$ , unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_o$	Output Voltage	$V_{IN} = 3.85 \text{V}$ $1 < I_o < 100 \text{mA}$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	2.828 2.822 2.779	2.85	2.872 2.878 2.921	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 4 \text{V}$ $1 < I_o < 100 \text{mA}$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	2.977 2.970 2.925	3	3.023 3.030 3.075	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 4.2 \text{V}$ $1 < I_o < 100 \text{mA}$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	3.176 3.168 3.12	3.2	3.224 3.232 3.28	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 4.3 \text{V}$ $1 < I_o < 100 \text{mA},$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	3.275 3.267 3.217	3.3	3.325 3.333 3.383	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 4.8 \text{V}$ $1 < I_o < 100 \text{mA},$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	3.771 3.762 3.705	3.8	3.829 3.838 3.895	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 5.85 \text{V}$ $1 < I_o < 100 \text{mA},$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	4.813 4.801 4.729	4.85	4.887 4.899 4.971	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 6 \text{V}$ $1 < I_o < 100 \text{mA},$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	4.962 4.950 4.875	5	5.038 5.050 5.125	$\text{V}$ $\text{V}$ $\text{V}$
$I_{out}$	Output Current Limit		150			$\text{mA}$
$\Delta V_o$	Line Regulation	$V_{O(\text{NOM})} + 1 < V_{IN} < 16 \text{V}$ , $I_o = 1 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$		0.003	0.014 0.032	$%/V_{in}$
$I_d$	Quiescent Current	ON MODE				
		$I_o = 0 \text{mA}$		80	100	$\mu\text{A}$
		$I_o = 0 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			150	$\mu\text{A}$
		$I_o = 1 \text{mA}$		100	150	$\mu\text{A}$
		$I_o = 1 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			200	$\mu\text{A}$
		$I_o = 25 \text{mA}$		250	400	$\mu\text{A}$
		$I_o = 25 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			800	$\mu\text{A}$
		$I_o = 100 \text{mA}$		800	1300	$\mu\text{A}$
		$I_o = 100 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			2600	$\mu\text{A}$
		OFF MODE				
		$V_{INH} < 0.3 \text{V}$			0.8	$\mu\text{A}$
		$V_{INH} < 0.15 \text{V}$ $-40 < T_J < 125^\circ\text{C}$			2	$\mu\text{A}$
SVR	Supply Voltage Rejection	$f = 1 \text{KHz}$ , $C_{out} = 10 \mu\text{F}$		63		$\text{dB}$
$V_d$	Dropout Voltage	$I_o = 0 \text{mA}$		1	3	$\text{mV}$
		$I_o = 0 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			5	$\text{mV}$
		$I_o = 1 \text{mA}$		7	10	$\text{mV}$
		$I_o = 1 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			15	$\text{mV}$
		$I_o = 25 \text{mA}$		70	100	$\text{mV}$
		$I_o = 25 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			150	$\text{mV}$
		$I_o = 100 \text{mA}$		200	250	$\text{mV}$
		$I_o = 100 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			375	$\text{mV}$
$V_{il}$	Control Input Logic Low	LOW = Output OFF $-40 < T_J < 125^\circ\text{C}$			0.18	$\text{V}$
$V_{ih}$	Control Input Logic High	HIGH = Output ON $-40 < T_J < 125^\circ\text{C}$	2			$\text{V}$
$I_i$	Control Input Current	$V_{INH} = 0 \text{V}$ , $-40 < T_J < 125^\circ\text{C}$ $V_{INH} = 5 \text{V}$ , $-40 < T_J < 125^\circ\text{C}$		0 5	-1 15	$\mu\text{A}$ $\mu\text{A}$
$eN$	Output Noise Voltage (RMS)	BW = 300 Hz to 50 KHz, $C_{out} = 10 \mu\text{F}$		160		$\mu\text{V}$
$I_{sc}$	Short Circuit Current	$R_L = 0$	150			$\text{mA}$

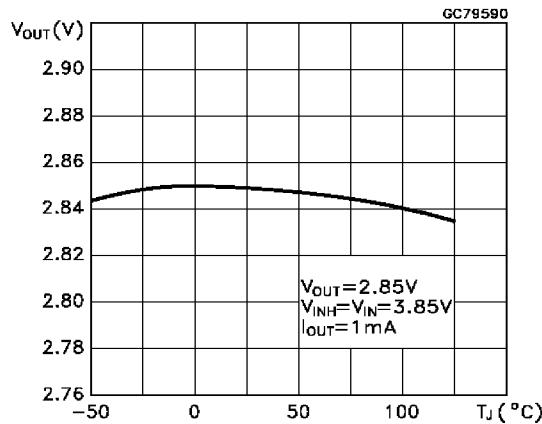


**ELECTRICAL CHARACTERISTICS FOR LD2981C** (refer to the test circuits,  $T_J = 25^\circ\text{C}$ ,  $V_{IN} = V_{O(\text{NOM})} + 1$ ,  $C_O = 1 \mu\text{F}$ ,  $I_O = 1 \text{mA}$ ,  $V_{INH} = 2\text{V}$ , unless otherwise specified)

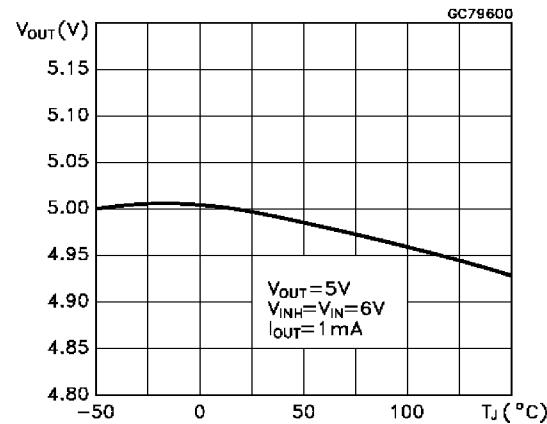
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_o$	Output Voltage	$V_{IN} = 3.85 \text{V}$ $1 < I_o < 100 \text{mA}$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	2.814 2.793 2.750	2.85	2.886 2.907 2.950	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 4 \text{V}$ $1 < I_o < 100 \text{mA}$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	2.962 2.940 2.895	3	3.038 3.060 3.105	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 4.2 \text{V}$ $1 < I_o < 100 \text{mA}$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	3.160 3.136 3.088	3.2	3.240 3.264 3.312	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 4.3 \text{V}$ $1 < I_o < 100 \text{mA},$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	3.259 3.234 3.184	3.3	3.341 3.366 3.416	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 4.8 \text{V}$ $1 < I_o < 100 \text{mA},$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	3.752 3.724 3.667	3.8	3.848 3.876 3.933	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 5.85 \text{V}$ $1 < I_o < 100 \text{mA},$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	4.789 4.753 4.680	4.85	4.911 4.947 5.020	$\text{V}$ $\text{V}$ $\text{V}$
$V_o$	Output Voltage	$V_{IN} = 6 \text{V}$ $1 < I_o < 100 \text{mA},$ $1 < I_o < 100 \text{mA}, -40 < T_J < 125^\circ\text{C}$	4.937 4.900 4.825	5	5.063 5.100 5.175	$\text{V}$ $\text{V}$ $\text{V}$
$I_{out}$	Output Current Limit		150			$\text{mA}$
$\Delta V_o$	Line Regulation	$V_{O(\text{NOM})} + 1 < V_{IN} < 16 \text{V}$ , $I_o = 1 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$		0.003	0.014 0.032	$%/V_{in}$
$I_d$	Quiescent Current	ON MODE				
		$I_o = 0 \text{mA}$		80	100	$\mu\text{A}$
		$I_o = 0 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			150	$\mu\text{A}$
		$I_o = 1 \text{mA}$		100	150	$\mu\text{A}$
		$I_o = 1 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			200	$\mu\text{A}$
		$I_o = 25 \text{mA}$		250	400	$\mu\text{A}$
		$I_o = 25 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			800	$\mu\text{A}$
		$I_o = 100 \text{mA}$		800	1300	$\mu\text{A}$
		$I_o = 100 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			2600	$\mu\text{A}$
		OFF MODE				
		$V_{INH} < 0.3 \text{V}$			0.8	$\mu\text{A}$
		$V_{INH} < 0.15 \text{V}$ $-40 < T_J < 125^\circ\text{C}$			2	$\mu\text{A}$
SVR	Supply Voltage Rejection	$f = 1 \text{KHz}$ , $C_{out} = 10 \mu\text{F}$		63		$\text{dB}$
$V_d$	Dropout Voltage	$I_o = 0 \text{mA}$		1	3	$\text{mV}$
		$I_o = 0 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			5	$\text{mV}$
		$I_o = 1 \text{mA}$		7	10	$\text{mV}$
		$I_o = 1 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			15	$\text{mV}$
		$I_o = 25 \text{mA}$		70	100	$\text{mV}$
		$I_o = 25 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			150	$\text{mV}$
		$I_o = 100 \text{mA}$		200	250	$\text{mV}$
		$I_o = 100 \text{mA}$ $-40 < T_J < 125^\circ\text{C}$			375	$\text{mV}$
$V_{il}$	Control Input Logic Low	LOW = Output OFF $-40 < T_J < 125^\circ\text{C}$			0.18	$\text{V}$
$V_{ih}$	Control Input Logic High	HIGH = Output ON $-40 < T_J < 125^\circ\text{C}$	2			$\text{V}$
$I_i$	Control Input Current	$V_{INH} = 0 \text{V}$ , $-40 < T_J < 125^\circ\text{C}$ $V_{INH} = 5 \text{V}$ , $-40 < T_J < 125^\circ\text{C}$		0 5	-1 15	$\mu\text{A}$ $\mu\text{A}$
$eN$	Output Noise Voltage (RMS)	BW = 300 Hz to 50 KHz, $C_{out} = 10 \mu\text{F}$		160		$\mu\text{V}$
$I_{sc}$	Short Circuit Current	$R_L = 0$	150			$\text{mA}$

**TYPICAL PERFORMANCE CHARACTERISTICS** (unless otherwise specified  $T_J=25^\circ\text{C}$ ,  $C_{IN}=C_{OUT}=1\mu\text{F}$ )

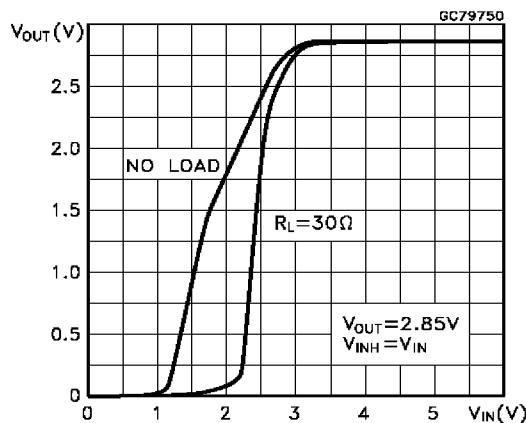
Output Voltage vs Temperature



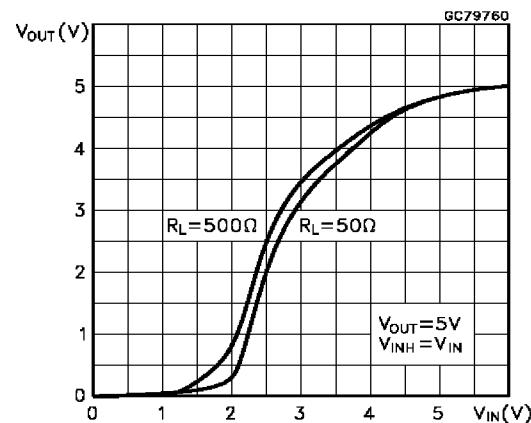
Output Voltage vs Temperature



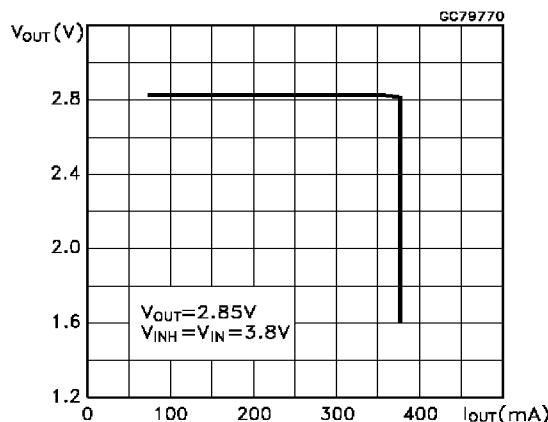
Output Voltage vs Input Voltage



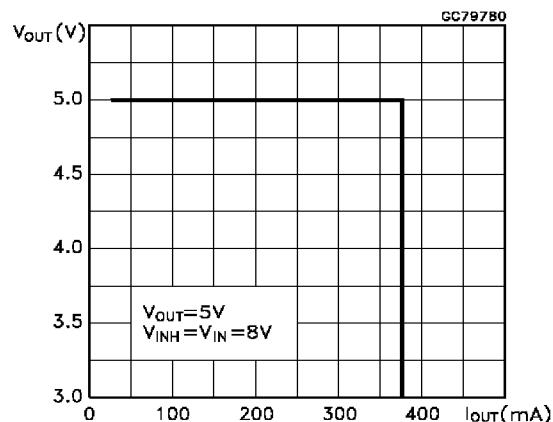
Output Voltage vs Input Voltage



Output Voltage vs Output Current

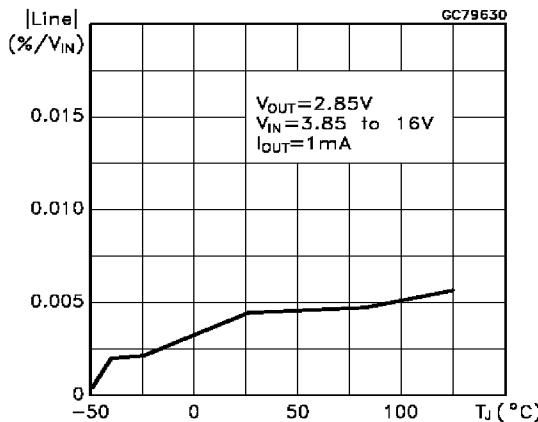


Output Voltage vs Output Current

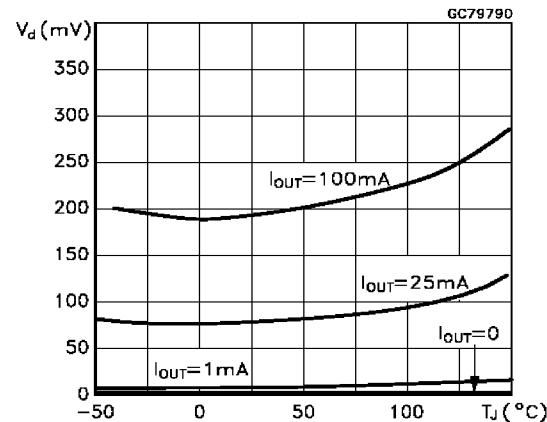


**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

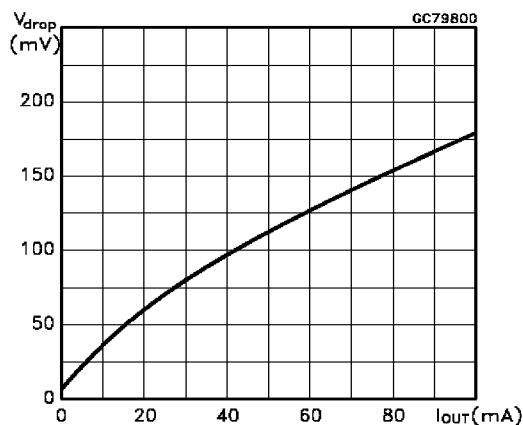
Line Regulation vs Temperature



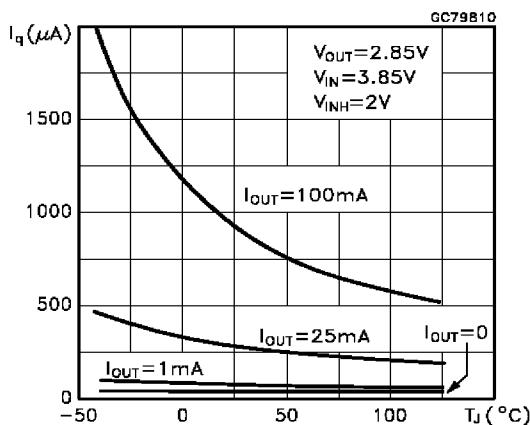
Dropout Voltage vs Temperature



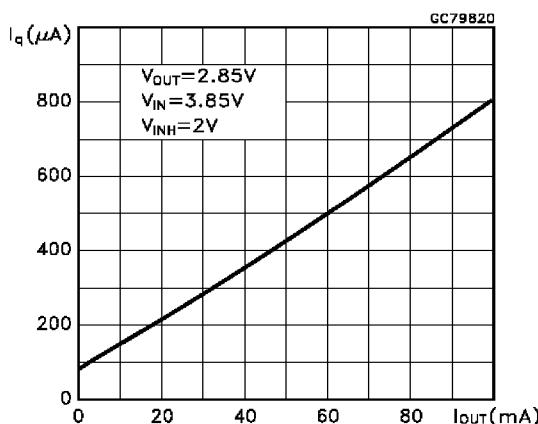
Dropout Voltage vs Output Current



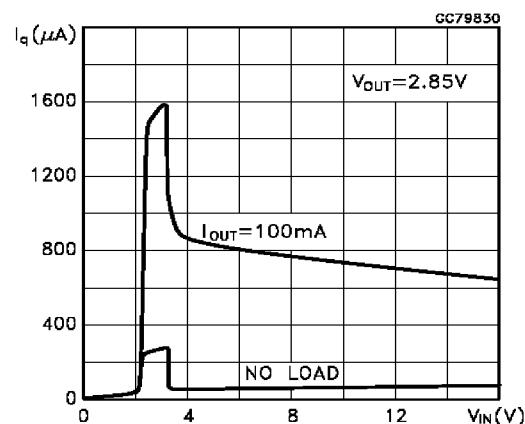
Quiescent Current vs Temperature



Quiescent Current vs Output Current

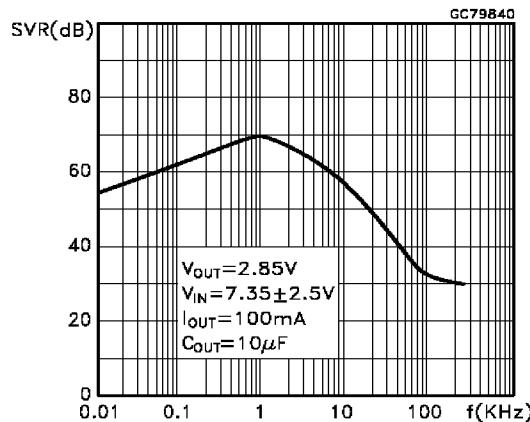


Quiescent Current vs Input Voltage

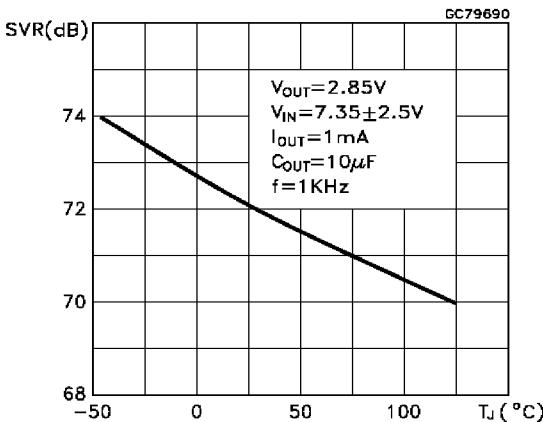


**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

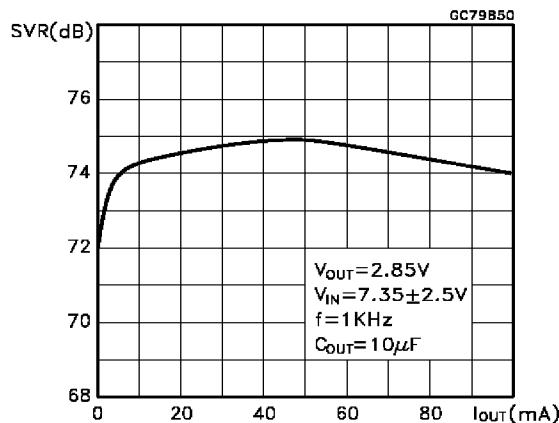
S.V.R. vs Frequency



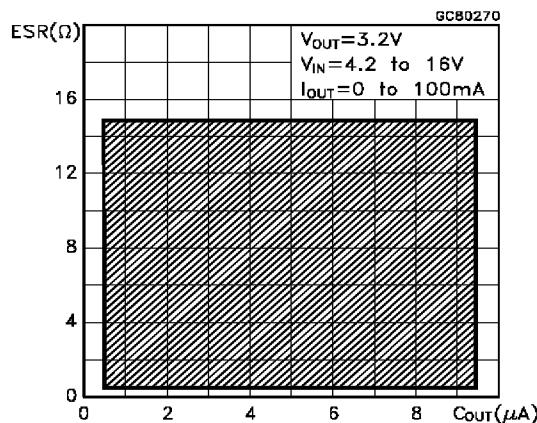
S.V.R. vs Temperature



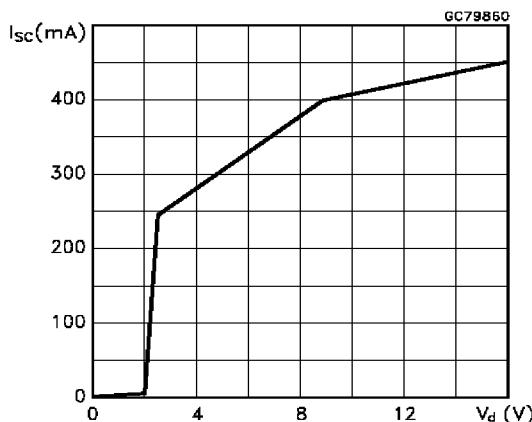
S.V.R. vs Output Current



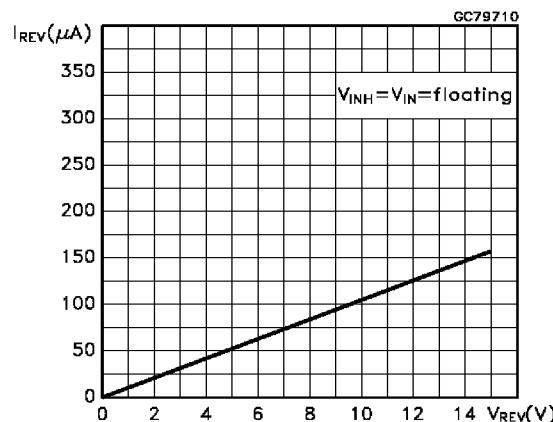
Stability



Short Circuit Current vs Dropout Voltage

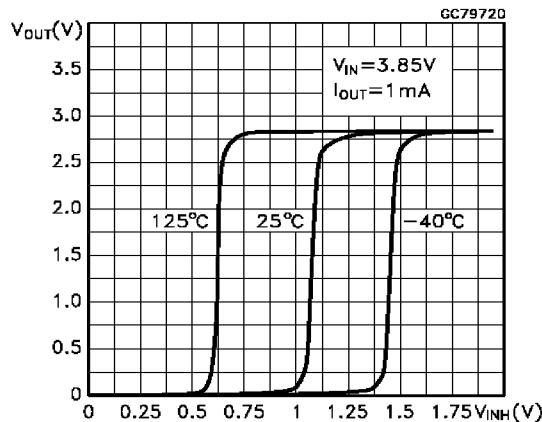


Reverse Current vs Reverse Voltage

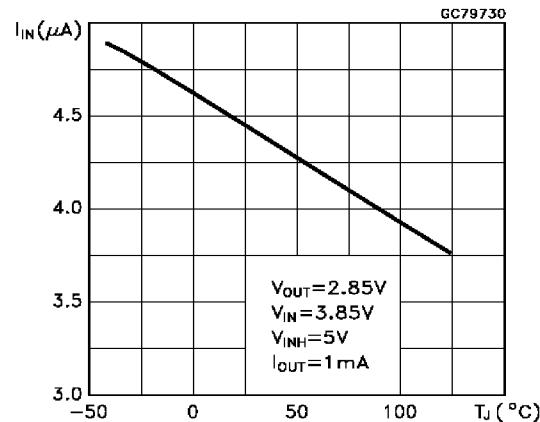


**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

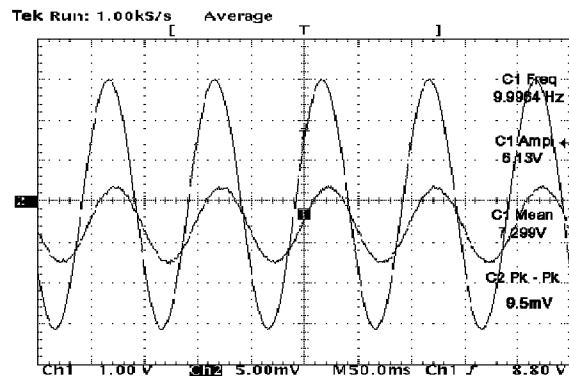
Output Voltage vs Inhibit Voltage



Inhibit Current vs Temperature

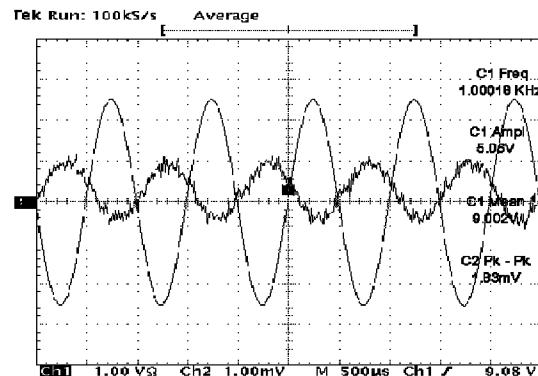


Supply Voltage Rejection at  $V_{OUT}=2.85V$



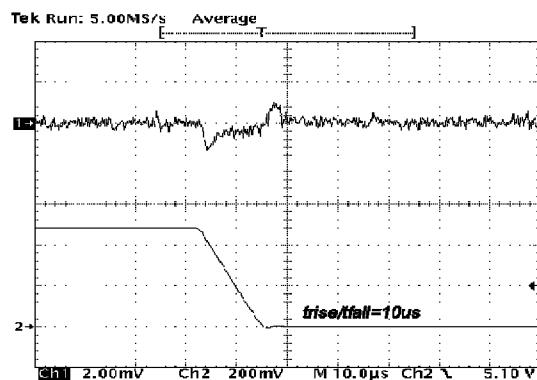
$V_{IN} = 7.35 \pm 2.5V$ ,  $I_{OUT} = 0.1A$ ,  $f = 1KHz$

Supply Voltage Rejection at  $V_{OUT}=5V$



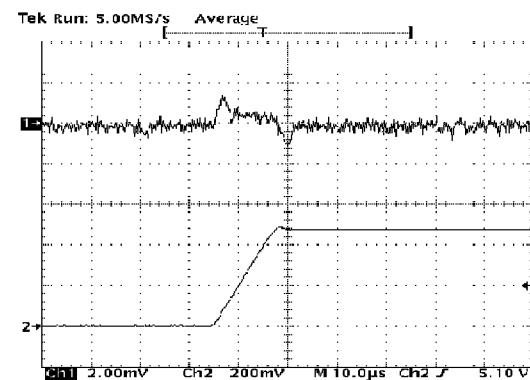
$V_{IN} = 9 \pm 2.5V$ ,  $I_{OUT} = 0.1A$ ,  $f = 1KHz$

Line Transient Response

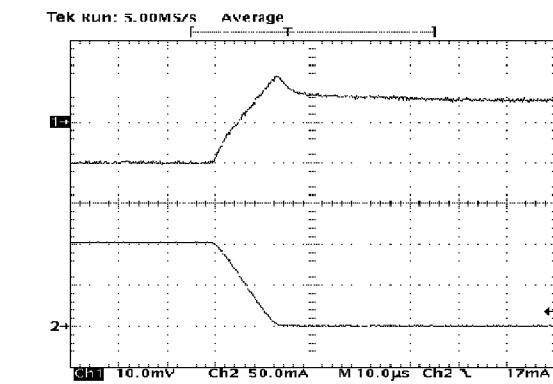


$V_{IN} = 4.75$  to  $5.25V$ ,  $I_{OUT} = 0.1A$ ,  $C_O = 10\mu F$  (ESR=1Ω at 1KHz)

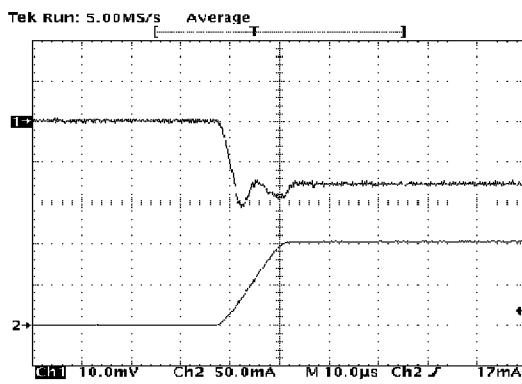
Line Transient Response



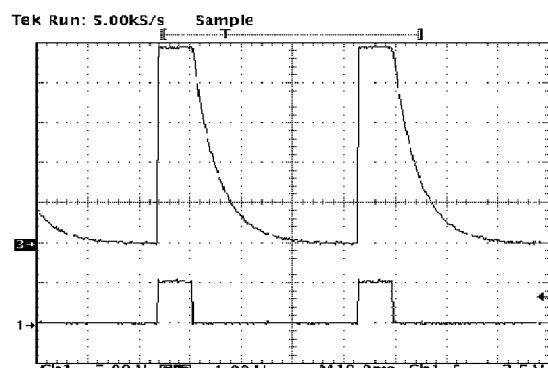
$V_{IN} = 4.75$  to  $5.25V$ ,  $I_{OUT} = 0.1A$ ,  $C_O = 10\mu F$  (ESR=1Ω at 1KHz)

**TYPICAL PERFORMANCE CHARACTERISTICS (continued)****Load Transient Response**

$V_{CC} = 5V$ ,  $I_{OUT} = 1$  to  $100mA$ ,  $C_{IN} = 150nF$   $C_{OUT} = 10\mu F$   
( $ESR=1\Omega$  at  $1KHz$ )

**Load Transient Response**

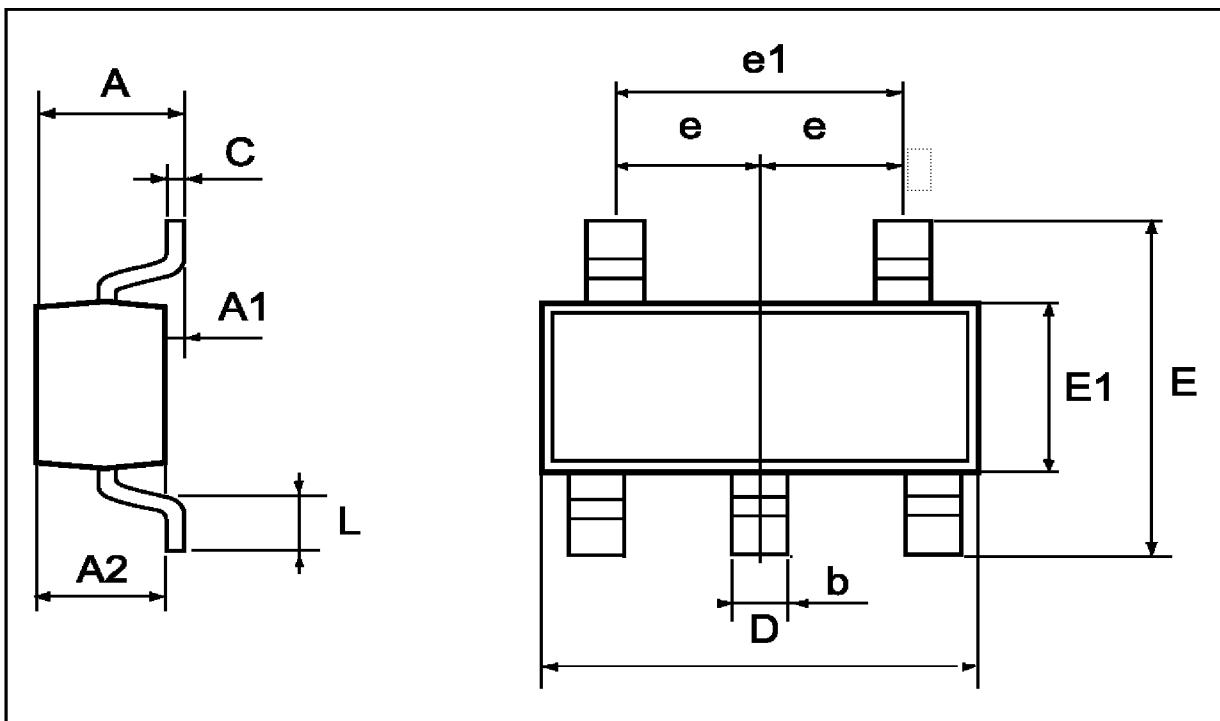
$V_{CC} = 5V$ ,  $I_{OUT} = 1$  to  $100mA$ ,  $C_{IN} = 150nF$   $C_{OUT} = 10\mu F$   
( $ESR=1\Omega$  at  $1Khz$ )

**Shutdown Transient Response**

$V_{OUT} = 5V$ ,  $V_{IN} = 6V$ ,  $V_{INH} = 0$  to  $5V$ ,  $C_{IN} = C_{OUT} = 1 \mu F$  (Tant.)

## SOT23-5L MECHANICAL DATA

DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.90		1.45	35.4		57.1
A1	0.00		0.15	0.0		5.9
A2	0.90		1.30	35.4		51.2
b	0.35		0.50	13.7		19.7
C	0.09		0.20	3.5		7.8
D	2.80		3.00	110.2		118.1
E	2.60		3.00	102.3		118.1
E1	1.50		1.75	59.0		68.8
L	0.35		0.55	13.7		21.6
e		0.95			37.4	
e1		1.9			74.8	



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